Observations on the artificial fertilization of eggs and larval rearing of the grey mullet, Mugil cephalus L.

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One of the economically important finned fish with great potentials for pond culture are the grey mullets. Like milkfish, they are tolerant to a wide range of salinity changes. Mullets have been cultured in ponds in several Mediterranean and Southeast Asian countries and in Hawaii (Thomson, 1966). However, the wide fluctuations as to the amount and seasonal occurrence of the fry had hampered rational planning for investment and development (Liao, 1974). Thus, to ensure an adequate supply of fry for stocking in ponds, experiments on the artificial propagation of the grey mullet have been conducted in Taiwan (Liao, 1974, 1977), in Hawaii (Shehadeh et al., 1972; Kuo et al., 1973) and Israel (Yashouv, 1969).

In the Philippines, no attempt has been made to artificially propagate and culture grey mullet in ponds despite the fact that it commands a high price in the market. This is the first report on the artificial fertilization of eggs and larval rearing of the grey mullet, *Mugil cephalus* in the Philippines.

On November 28, 1977, a gravid female and a running male caught by purse seine in the fish corral were transported in plastic bag filled with seawater to the laboratory at Tigbauan. During transport, the female partially spawned and the male partially released milt. Upon arrival at the laboratory, the female was stripped of its eggs while the male was sacrificed to be able to obtain as much milt as possible. The dry method of fertilization (Chaudhuri et al, 1978) was followed. The eggs were washed thoroughly with seawater and transferred to a one-ton fiberglass tank. Six aliquots of eggs were taken to get an estimate of the fertilization rate. Of 600,000 eggs, only 60% had been fertilized.

Table 1 and Fig. 1 show the embryonic development of *M. cephalus*. Hatching occurred 25 hours after fertilization, at a water temperature of 28°C–30.5°C and a salinity of 32-33 ppt. The hatching rate was estimated to be 42%. Hatchlings averaging 1.8 mm long (N = 20) were transferred to 400-liter fiberglass tanks for larval rearing experiments. *Isochrysis* sp. and *Brachionus* sp. were given on day 1. Although the mouth opened on day 2, feeding began on day 3. The yolk was completely absorbed on day 6 and the oil globule completely disappeared on day 8.

Table 1. Embryonic development of *Mugil cephalus* at 28°C-30.5°C and at a salinity of 32-33 ppt.

Time after fertilization (hr : min)	Stage of development	Description
00:00	fertilized egg	Spherical, non-adhesive, with single large oil globule, mean diameter is 0.86 mm (N = 20)

01:05	2 – cells	1st cleavage, meridional
02:00	4 – cells	2nd cleavage, meridional at right angles to the first
02:20	8 – cells	3rd cleavage, cleavage furrow parallel to the first
02:33	16 – cells	4th cleavage, furrow parallel to the second
02:42	32 – cells	5th cleavage, furrow meridional at right angles to the 1st & 4th
02:50	64 – cells	6th cleavage, blastomeres decreased in size
03:05	many cells	Blastomeres further reduced in size
03:38	blastula	Blastodisc elevated
05:47	gastrula	Gastrulation started, blastoderm starts spreading over the yolk
06:10		Yolk invasion, halfway through
06:45		Yolk invasion complete, yolk plug and blastopore visible, embryonic shield thickened
08:00		Primitive streak prominent
10:05		Somatic segmentation begins, head and tail became differentiated, optic vesicles apparent
11:00		Otic vesicles began to form
13:30		Embryo C-shaped, melanophores appeared
15:45		Embryo disengaged its tail from yolk
18:45		Twitching body movement observed, heart started to pulsate
22:15	Hatching	Embryo breaking off its egg shell

23:00	Hatching	Embryo slowly emerging out of its egg shell, head first
23:30	Hatching	Hatching about 1/3 complete
25:00	Free larva	Larva separated from its egg shell, newly hatched larva has an average length of 1.8 mm (N = 20)

Chlorella was added to the experimental larval rearing tanks to maintain water quality. Mortality was observed at the onset of feeding and when silvering began. Mass mortality occurred on day 18 and 19 i.e. during the third week of rearing. It occurred at high noon and was apparently due to swimbladder inflation, coinciding with the diatom bloom in the tanks. Larvae with inflated abdomen began to float, swam weakly along the corners of the tanks and ultimately died. Of the 153,000 hatchlings, only 26 survived to date.

On 26 December 1977 another gravid female and a running male were caught from the Tigbauan fish corral. These were transported to the laboratory and were sacrificed to obtain eggs and sperms. Of the 430,000 eggs obtained only 16% was fertilized. Of the 69,000 eggs that were fertilized 82% hatched. Of these only 6 survived to date. Mass mortality occurred on day 3 and 4 and from day 12 onwards.

With the experience gained it is hoped that better survival will be obtained in the next mullet season.

Note: *Species identification of the grey mullet was done by Dr. Reynaldo de la Paz, Associate Professor of Zoology, University of the Philippines, Quezon City.*

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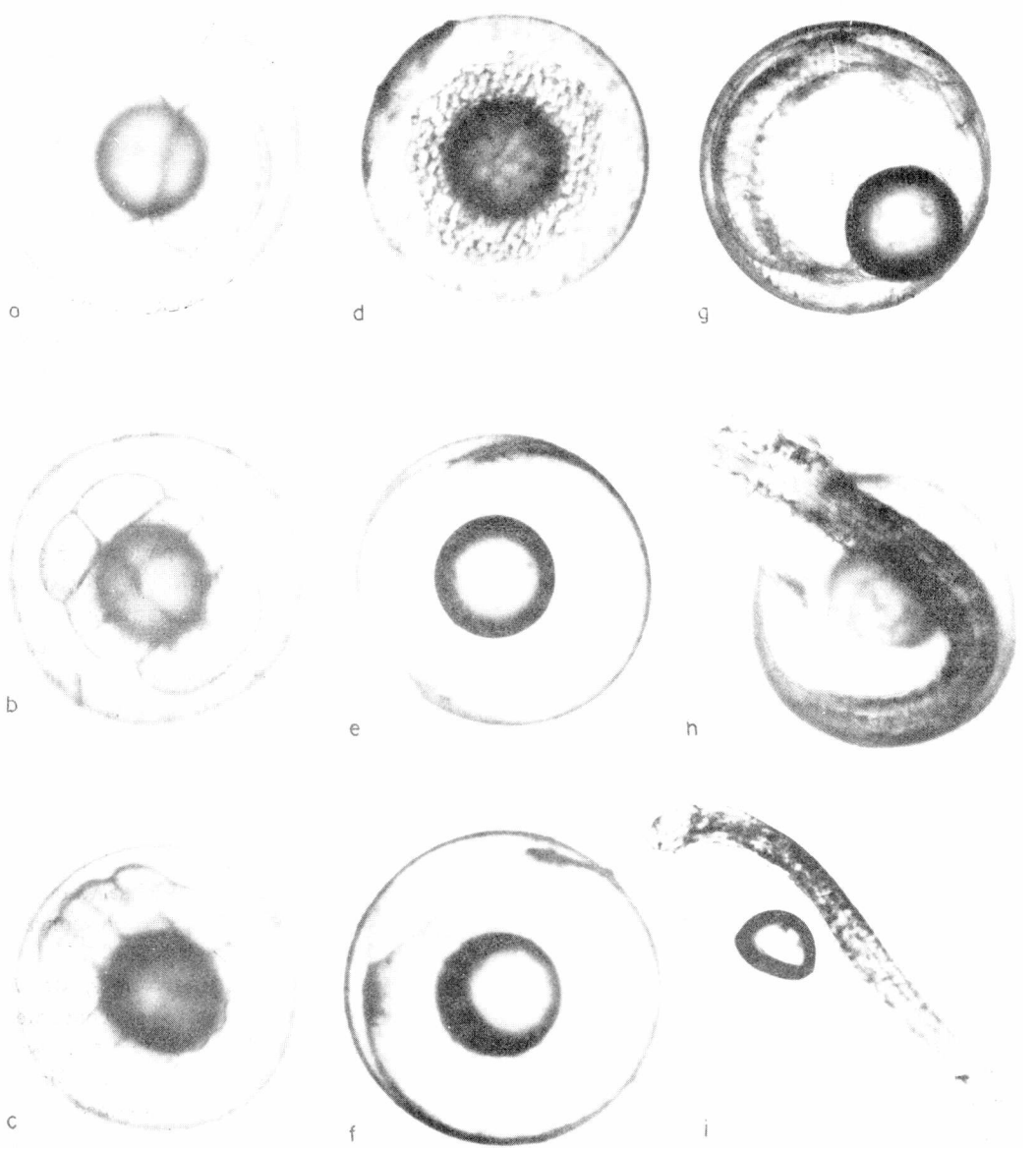

Fig. 1 a) 2-cell stage, b) 8-cell stage c) 16-cell stage d) many cell stage e) late gastrula f) neurula g) C-shaped embryo h) embryo emerging from the egg shell i) newly-hatched larva. The mean egg diameter is 0.86 mm (N = 20) while the mean total length of the newly hatched larva is 1.8 mm (N = 20).